up a hard disc drive. In particular, it includes a combination of the spindle motor, base and voice coil motor of the hard disc drive.

Referring to FIG. 1, the major elements of the hard disc drive system 10 of the present invention are shown, including hard disc 100, spindle motor assembly 200, and an actuator assembly 300. These components are attached to a base portion 108 of a housing. The base plate 108 is preferably made of stamped steel. A shell portion forms a cover 111, and in conjunction with the base portion 108, encloses the aforementioned disc drive components.

The disc 100 has a centrally located aperture through which a hub 102 extends. The hard disc 100 is rotatably supported on the hub 102, which is an integral part of the rotor 210 of spindle motor assembly 200. In the preferred embodiment of the present invention and as depicted in FIG. 1, one concentrically aligned disc 100 is positioned on the hub 102. The disc drive depicted is a single disc system; however, to increase storage capability, multi-disc systems are foreseeable.

As depicted in FIG. 1, the hard disc 100 is preferably rotated by the spindle motor assembly 200. In addition to integral hub 102, the spindle motor 200 includes a stator 204, a rotor 210, a shaft 206, and bearings 208. The stator 204 has a plurality of poles 207 with wire windings 205. The wire windings 205 serve as conductors and induce or otherwise create a plurality of magnetic fields when electrical current is conducted through the conductors.

In the present embodiment, the integral hub 102 is fixedly mounted to shaft 206 forming the axis of rotation of the motor 202. The shaft 206 is mounted

to the base plate 108 by gluing or other conventional mounting means. Bearings 208 are journalled about the shaft 206 and support rotor 210 comprised of the hub 102 and a permanent magnet 214 positioned on a outer surface of the hub 102 facing the stator 204. The interaction of a magnetic field generated by the stator 204 with the rotor permanent magnets 214 propels the rotor 210 to spin. The rotor 210, having the hub 102 as an integral component, rotates the hard disc 100. In the preferred embodiment shown in FIG. 1, there is also a housing 215 that houses bearing supports 208 and shaft 206. The base 215 is not essential to practice the invention and can be removed, and instead the hub 102 can be used to house the bearing supports 208 and shaft 206. Other motor configurations that can be manufactured using concepts of the present invention are disclosed in U.S. Patent No. 6,300,695 issued October 9, 2001, incorporated herein by reference.

The actuator assembly 300 has a voice coil motor 400, as illustrated in FIG. 2, that drives an actuator arm 320 (FIG. 3) to pivot and swing back and forth over the disc surface 500 to read and write data. The actuator assembly arm 320 is attached to a shaft 306 at one end. The other end of the actuator arm has a head 330 that reads and writes data. The shaft 306 is mounted to the base plate 108 by gluing or other conventional mounting means. Bearings 308 are journalled about the shaft 306. The bearing supports 308 and shaft 306 are housed in a metal housing 310. The metal housing 310 is preferably made of steel.

Referring to FIG. 1, a monolithic body 250 of phase change material is injection molded onto the non-moving components of the hard disc drive system 10. Although the embodiment in FIG. 1 shows all of the non moving parts

injection molded with a monolithic body of phase change material, one of ordinary skill in the art will understand that any combination of parts may be unitized with a monolithic body of phase change material to help obtain a predictable system-wide harmonic resonance for the unitized parts.

As shown in FIG. 2, an actuator motor or voice coil motor 400 is substantially encapsulated with a monolithic body 450 of phase change material to unitize the non-moving subcomponents of the actuator motor 400. Substantially encapsulated means that the monolithic body surrounds enough surface area of a component so that it effectively alters the resonance spectrum of that component to a single resonance spectrum or to a desired resonance spectrum. A pole piece 414 is disposed beneath the portion of actuator 300 which incorporates coil 416, and which in cooperation with magnet 418 and pole piece 414, functions to drive actuator 300 about bearing 308 and pivot axis 422. The monolithic body 450 unitizes the subcomponents of the actuator motor. The unitized subcomponents behave as a single component and have the same resonance spectrum and vibrational characteristics. FIG. 3 illustrates a perspective view of a hard disc drive showing the placement of actuator 300 in a hard disc drive. The unitized actuator motor formed by the method of injection molding of the present invention has a reproducible resonance spectrum.

Illustrated in FIG. 4a is a stator 204 having a plurality of poles 207 with wire windings 205. As illustrated in FIG. 4b, in another embodiment of the present invention, only the stator 204 is substantially encapsulated with a monolithic body 450 of phase change material with the method of the present